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NATIONAL DAM SAFETY PROGRAM. JUMPING BROOK DAM (NJ00084), ATLAN--ETC(U)
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ATLANTIC COAST BASIN
JUMPING BROOK
MONMOUTH COUNTY
NEW JERSEY

LEVEL II

JUMPING BROOK DAM
NJ00084

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

March 1976

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00084
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): Phase I Inspection Report
National Dam Safety Program
Jumping Brook Dam
Monmouth County, N.J.

5. TYPE OF REPORT & PERIOD COVERED: (9) FINAL rept.
6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): (10) F. Keith Jolls, P.E.

8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-78-C-0124

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Louis Berger & Assoc. Inc.
100 Halsted St.
East Orange, N.J.

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
U.S. Army Engineer District, Philadelphia
Custom House, 2d & Chestnut Streets
Philadelphia, Pennsylvania 19106

12. REPORT DATE: (11) Mar[illegible]79
13. NUMBER OF PAGES: 64

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): (12) 66p.

15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(6) National Dam Safety Program, Jumping Brook Dam (NJ00084), Atlantic Coast Basin, Jumping Brook, Monmouth County, New Jersey. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Embankments
Structural Analysis
Safety
Visual Inspection
Junping Brook Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

9 APR 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Jumping Brook Dam in Monmouth County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Jumping Brook Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. The dam's spillway is considered inadequate since 19 percent of the 100-year flood would overtop the dam. The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the dam's low hazard classification, small size, and expectation that failure of the structure would probably result in no loss of life and very minimal economic loss. For the same reasons no further studies or increase of spillway capacity are recommended. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Within one year from the date of approval of this report, the following actions should be taken:

(1) Regrade and provide slope protection for the downstream embankment area to the left of the spillway.

(2) Refill and provide slope protection for the embankment area behind the right abutment wingwall.

(3) Remove trees on the embankments to lessen the piping potential.

NAPEN-D
Honorable Brendan T. Byrne

(4) Place additional riprap in the downstream apron area to provide scour protection.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James J. Howard of the Third District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
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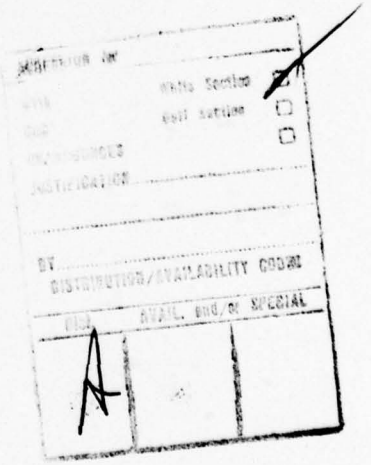

JUMPING BROOK DAM (NJ00084)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 15 December 1978 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The state, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Jumping Brook Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. The dam's spillway is considered inadequate since 19 percent of the 100-year flood would overtop the dam. The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the dam's low hazard classification, small size, and expectation that failure of the structure would probably result in no loss of life and very minimal economic loss. For the same reasons no further studies or increase of spillway capacity are recommended. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Within one year from the date of approval of this report, the following actions should be taken:

(1) Regrade and provide slope protection for the downstream embankment area to the left of the spillway.

(2) Refill and provide slope protection for the embankment area behind the right abutment wingwall.

(3) Remove trees on the embankments to lessen the piping potential.

(4) Place additional riprap in the downstream apron area to provide scour protection.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 9 March 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Jumping Brook Dam Fed ID# NJ 00084 and NJ ID# 598

State Located New Jersey
County Located Monmouth
Coordinates Lat. 4012.2 - Long. 7404.0
Stream Jumping Brook
Date of Inspection 15 December 1978

ASSESSMENT OF GENERAL CONDITIONS

Jumping Brook Dam is assessed to be in an overall good condition and is recommended to be downgraded from a high hazard to a low hazard category. A failure of the dam would not significantly increase the danger of loss of life or property damage as the downstream flood plain is uninhabited. No detrimental findings were uncovered to render a significantly hazardous assessment. Remedial actions recommended to be undertaken in the future are 1) regrade and protect the downstream embankment area to the left of the spillway, 2) refill and construct slope paving behind the right wingwall, and 3) remove trees and large dead root systems on the embankment slopes. Consideration could be given to demolishing the dam spillway entirely as the structure now serves no useful purpose.

This dam has an inadequate spillway capacity, being able to accommodate only 18% of the design flood.

F. Keith Jolls P.E.
Project Manager

OVERVIEW OF JUMPING BROOK DAM

December 1978

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: JUMPING BROOK DAM FED ID# NJ 00084

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia, to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Jumping Brook Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Jumping Brook Dam consists of a low embankment whose original design width was 300 feet which impounds a relatively narrow reservoir. The maximum reservoir depth was 8 feet when built but the reservoir is now almost completely silted in. The embankment crest is about 20 feet wide and encloses a 72 foot timber spillway which has a partially riprapped downstream slope. The spillway is about 70 feet from the right abutment and carries the stream overflow uniformily across its width.

b. Location

The dam is located in Neptune Township on the north branch of the Shark River (known locally as Jumping Brook) and is about one mile above the river's outfall into the Shark River Bay near the sewage disposal plant of the Evans Signal Laboratory Military Reservation. It is about 500 feet upstream from the Corlies Road bridge and the Neptune City sewage disposal plant presently under construction. The water supply pumping station facilities of the Monmouth Consolidated Water Company are located immediately behind the left abutment.

c. Size Classification

The maximum height of the dam at the spillway is 10 feet and its maximum storage capacity is estimated to be approximately 130 acre-feet. The dam therefore is in the small size category as defined by Corps of Engineers criteria.

d. Hazard Classification

Based upon the Corps of Engineers evaluation criteria, and the fact that the field inspection revealed little damage would be inflicted on downstream property and human life would not be endangered if a collapse should occur, it is recommended the hazard classification be downgraded to low hazard. There are no residences or commercial development immediately downstream except for several of the City of Neptune aeration tanks that are located near the flood plain. Additionally, due to the heavy siltation in the reservoir and the relatively steep natural channel gradient of Jumping Brook, the height of any flood waters, should the dam collapse, would be minimal and would be substantially dissipated before reaching the Route 18 bridge about three-quarters of a mile downstream.

e. Ownership

The dam is owned by the Monmouth Consolidated Water Company, 661 Shrewsbury Avenue, Shrewsbury, New Jersey.

f. Purpose of Dam

Although originally constructed as a power supply facility, its principal use since 1907 has been as a public water supply intake. At the present time, the intake facilities are not being used by the Water Company.

g. Design and Construction History

A grist mill originally occupied this site prior to 1907 when a 30--foot timber spillway was constructed by the East Jersey Coast Water Company and water supply intake was instituted. In 1920, after severe damage, the spillway was rebuilt. The dam was not overtopped at that time but a 35 foot gap was scoured out which was attributed to muskrat burrowing and subsequent piping and erosion. The embankment was repaired and the spillway widened to its present 72-foot width in 1955 by the current owners who have erected extensive water storage and treatment facilities at the site.

h. Normal Operating Procedures

The dam and the adjacent facilities are operated by the owner as a part of their overall intake system for municipal water supply. However, the intake facilities from this reservoir have not been used for many years as evidenced by the complete blockage of the intake headwall in the left embankment.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area for Jumping Brook dam is 6.4 square miles.

b. Discharge at Dam Site

The spillway capacity at a non-overtopping design flood (as computed by the Water Company) is approximately 1200 cfs. Maximum capacity with abutments awash is 1700 cfs as computed herein.

c. Elevation (Above M.S.L.)

Top of dam - +25.2 (lower left crest elevation)
- +28.8 (right embankment)

Recreation pool - +21.2 (spillway crest)

Streambed at Center Line of Dam - +15±

d. Reservoir

Length of Recreation Pool - 1600 feet
Length of Maximum Pool - 2000 feet

e. Storage

Recreation Pool - 60 acre-ft.
Top of dam (El. 25.8) - 130 acre-ft.

f. Reservoir Surface

Recreation Pool - 13 acres
Top of dam - 17 acres

g. Dam

Type - Earth embankment with timber spillway
Length - 300 feet (177 feet effective crest length)
Height - 10 feet
Freeboard between normal reservoir and top of dam - 4.6 feet
Top width - 20 feet
Side slopes - Varies (2H:1V) with considerable areas much flatter.
Zoning - Composition and compactness unknown

h. Diversion and Regulating Tunnel

None

i. Spillway
Type - Timber-broad crested weir
Length of weir - 72' (overall)
Crest Elevation - +21.2

j. Regulating Outlets

None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The following design drawings were available:

1) East Jersey Coast Water Company Drawing B64 dated July 1907, which depicted the original 29'-10" right hand section of the timber spillway.

2) Monmouth County Water Company Drawing B213 dated March 1920, which depicted the site plan of the earlier spillway detailed on the 1907 drawing and the grading of the embankment where the early breaching occured.

3) American Water Works Service Company, Inc. Drawings 73-804 and 73-657 dated October 1961 which depicted the additional spillway construction (widening the earlier spillway to 72 feet).

No design information was available regarding foundation conditions or methods of construction. The highly variable recent alluvium soils consist of sandy silts and silty sands with occasional clay layers. The internal drainage is quite good. The depth of bedrock varies considerably within the river valley and is estimated to be over 50 feet beneath the dam. The field inspection measurements confirmed that the available plans were substantially correct.

2.2 CONSTRUCTION

No information was available as to the names of the general contractors or how the construction was accomplished. The 11-foot timber downstream apron indicated on the earlier drawings has been demolished and replaced with grouted riprap. The inspection catwalk indicated on the plans is also demolished although the support timber remains.

2.3 OPERATION

The dam operates satisfactorily as engineered (see Section 4).

2.4 EVALUATION

a. Availability

In view of the dam assessment and recommendations set forth in Section 7, it is believed sufficient design data was available.

b. Adequacy

In view of the dam's assessment and recommendations set forth in Section 7, it is believed the field inspection and information furnished by the Monmouth Consolidated Water Company provides adequate engineering data upon which to base a cogent assessment without recourse to additional research and analysis.

c. Validity

The validity of the record plans is not challenged and is accepted without recourse to further investigations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The on-site inspections and conferences with Water Company engineering personnel revealed all of the pertinent facts regarding Jumping Brook Dam except the condition of several of the older underground piping systems. This station processes water derived from the pumped storage at the Glendola Reservoir, Shark River, Jumping Brook and Water Company wells #4 and 5. It is felt that the exact location and methodology of their supply system was not germane to the vital aspects of the dam inspection, especially in view of the fact that the intake is not currently being used.

b. Dam

The original as-built length of embankment was recorded to be 300 feet, but due to subsequential filling and grading, construction of utility roads and the long-term reforming of the original design slopes, the present length of dam embankment insofar as the effective hydraulic capacity is concerned is approximately 177 feet as measured by the inspection team. The right abutment merges into a steep natural hill just west of the spillway while the left embankment forms a semi-circular arch swinging to the north after crossing the spillway (see Figure 2). The right abutment is protected by a timber bulkhead left over from the earlier spillway and the left embankment is protected both upstream and downstream by quarry stone and concrete slope protection. There is some minor erosion behind the right spillway bulkhead but this appears to be caused mainly by surface run-off from the bluff to the west. There is considerable secondary growth on the embankments and, except for the area immediately adjacent to the spillway, the design slopes have flattened considerably.

c. Appurtenant Structures

The timber spillway is in fairly good condition, especially when considering the age of the older 29-foot section on the west end. The vertical bulkhead is in good alignment and there are no apparent structure failures. About 35 feet upstream from the left abutment there is a concrete headwall and water supply intake which feeds a 16-inch cast iron main that extends to a downstream settling basin and coagulation tank. The inspection catwalk over the spillway has been demolished, but its supporting piers remain in usable condition. The right end of the spillway is at a slightly (1" to 2") lower elevation than the left end and carries the low water overflow. The plank and riprap backslopes are on 6V:12H and 3V:12H slopes respectively. They are also in satisfactory condition. The plans indicate the existence of a 16" blow-off line centered under the older spillway section, but its inverts could not be observed and it is apparently now blocked up. Water Company engineers were not sure if this line exists, but if so, it is unusable in its present buried condition.

d. Reservoir

The original reservoir was 8 feet deep but due to the heavy siltation (as evidenced by marsh growth), is less than half that now. The water depth immediately upstream from the spillway is between 2 and 3 feet. The natural banks are quite steep and heavily wooded. The diminished storage capacity is obviously an unimportant factor in the Water Company's present operations.

e. Downstream Channel

Below the dam Jumping Brook passes under Old Corlies Road in a narrow but well-defined channel. The Old Corlies Road bridge is about 40 feet above the stream and is approximately 180 feet long. Immediately below that is the new Neptune Township waste water plant (currently

under construction). All of its buildings and facilities appear to be well above the flood plain. The lower reaches of the downstream channel are uninhabited, until Jumping Brook flows under Route 18, and are on a relatively steep gradient, dropping 15 feet in three-quarters of a mile.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Since this impoundment is no longer utilized as part of the Monmouth Consolidated Water Company's storage system, operational procedures are essentially nonexistent. However, because of the water supply filtration facilities located here, water company personnel are normally on duty 24 hours a day. From discussions with the Superintendent, operational activity at the dam consists primarily of visual inspections.

4.2 MAINTENANCE OF DAM

The dam is periodically inspected and required maintenance undertaken when necessary. The last recorded repairs to this dam were performed in 1955.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facilities at this dam are two 16-inch conduits. One pipe is an intake to the plant and is presently clogged. The other is the blowoff line under the timber spillway and could not be observed by the inspection team. The stem and wheel for the blowoff gate are missing. Neither conduit is maintained any longer by the Water Company.

4.4 DESCRIPTION OF WARNING SYSTEM

None exists except for the physical monitoring by Water Company personnel.

4.5 EVALUATION

The lack of operational procedures are not seen as a detrimental factor in assessing the hazard potential of this dam since the spillway functions effectively as a low waterfall in the riverbed (due to the heavy siltation of the reservoir). The original embankment sections have been stabilized by filling and sedimentation

to the point where the original embankment is no longer discernable and merges with the surrounding natural terrain. Consequently, present procedures are deemed to be adequate.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

In accordance with the criteria in the Recommended Guidelines for Safety Inspection of Dams, it has been determined that the dam at Jumping Brook Reservoir is small in size and is placed in the low hazard category. Accordingly, the spillway design flood (SDF) was selected by the inspection team to be the 100-year frequency event. The inflow hydrograph was calculated using precipitation data from Technical Paper 40. The inflow hydrograph and routing through the reservoir were performed utilizing the HEC-1 computer program. Peak inflow to the reservoir was 9,650 cfs which when routed through the reservoir, was reduced slightly to 9,440 cfs. The spillway capacity before overtopping, which occurs at the lower embankment crest, is approximately 1,700 cfs and thus will accommodate only 18% of the design flood. This flood would cause the foreshortened dam to be overtopped by approximately 5 feet. This figure is calculated based on the effective observed width of 177 feet and not the original design width of 300 feet. Hence, the overtopping depth is quite conservative.

b. Experience Data

The dam was originally designed by the owners to accommodate a storm with a peak discharge of 1200 cfs. For this flow, the spillway is adequate. As previously stated, a 35-foot long section of the dam failed in 1920 after a heavy rainstorm. However, the failure was thought to be caused by piping or percolation through the embankment and not by overtopping (further, the spillway was only 30 feet wide at that time). There are no other streamflow records or records of overtopping available.

c. Visual Observations

The hydraulic aspects of the dam appear to be satisfactory in light of the assessment contained in Section 7. The spillway and embankment actually act as a low weir in the relatively confined and steep natural channel and it is felt the structure could sustain fairly heavy flows without undue danger of collapse.

d. Overtopping Potential

It is unknown if the dam embankment has been overtopped in the past. However, the spillway is clearly not capable of containing the design flood. Thus, the potential for overtopping remains substantial in view of the hydraulic analysis contained herein. It is noted that the lower left embankment would tend to act as an auxiliary spillway in the event of larger discharges.

e. Drawdown Potential

There are no means of drawing the lake down at the present time. Utilizing the abandoned 16-inch C.I. blowoff pipe (with an invert 6.5' below the spillway crest) it would require approximately 2.5 days to dewater the reservoir, assuming no inflow.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Due to the heavy siltation in the reservoir, the embankment portions of the dam are no longer of primary significance as retaining structures, and the spillway is acting principally as an uncontrolled low weir. In its present usage and position, its structural stability, although felt to be in an adequate condition is of minor importance. Barring any negative operational effects such action would have on Water Company facilities, the spillway could, in fact, be removed.

b. Design and Construction Data

The structural review concludes that there is little concern regarding the stability of the spillway. The original design appears to have been carried out on a conservative basis and the elements are in remarkably good condition considering their age.

c. Operating Records

According to Water Company engineering personnel, there have been no structural problems in maintaining this dam in operational fitness.

d. Post Construction Changes

There have been no post-construction modifications made since the 1955 spillway widening.

e. Seismic Stability

Experience indicates that dams of this modest height in Zone 1 will have adequate stability under dynamic loading conditions if stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS
PROPOSED REMEDIAL MEASURES

7.1 ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Jumping Brook Dam is evaluated as being in a sound and satisfactory overall condition, although the spillway is incapable of transmitting the 100-year frequency design flood. In accordance with the Recommended Guidelines for Safety Inspection of Dams criteria, only 18% can be transmitted before overtopping occurs. However, it is felt the structure can sustain considerable flooding conditions without detrimental consequences. As there are minimal downstream hazards to life or property, a collapse would cause little damage except to the dam itself. In view of the above, the hazard category is recommended to be downgraded from a high to a low classification. No detrimental findings were revealed in this inspection to render a questionable judgement as to the structural adequacy, and the dam is judged to be in an overall good condition.

b. Adequacy of Information

The information gathered for the Phase I inspection is deemed to be adequate regarding the structural stability of the dam. However, no recent surveys have been made.

c. Urgency

No urgency is attached to implementing further studies and it is recommended that the remedial measures enumerated below be taken under advisement in the future.

d. Necessity for Further Study

Due to the low hazard classification of the dam and the fact that no property damage (at present levels of downstream development) is foreseen in case of a failure, further engineering studies are deemed unnecessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The attached calculations indicate that the spillway can accommodate only 18% of the design flood. Widening of the present spillway appears to be infeasible. Any overtopping will initially be concentrated at the low point in the embankment immediately to the left of the spillway structure.

a. Alternatives

On the basis of visual inspection, improvements to the present spillway are not warranted. The downstream face of the embankment to the left of the spillway could be further protected with slope paving and in effect, act as an auxiliary spillway. Additionally, the embankment area behind the right abutment wingwall should be regraded and protected with concrete or asphalt slope protection. Other remedial measures to be taken under advisement in the future include:

1) removal of the trees and large dead root systems on the embankments to lessen the piping potential;

2) placing additional riprap in the downstream apron area; and

3) Reconstructing or protecting the older left portion of the spillway.

While the possibility of adverse environmental effects has been studied, consideration could be given to the removal of the dam spillway thus allowing the silted reservoir area to revert to a natural channel slope.

b. O&M Maintenance and Procedures

No additional procedures other than those presently in effect appear to be warranted in view of the above assessment.

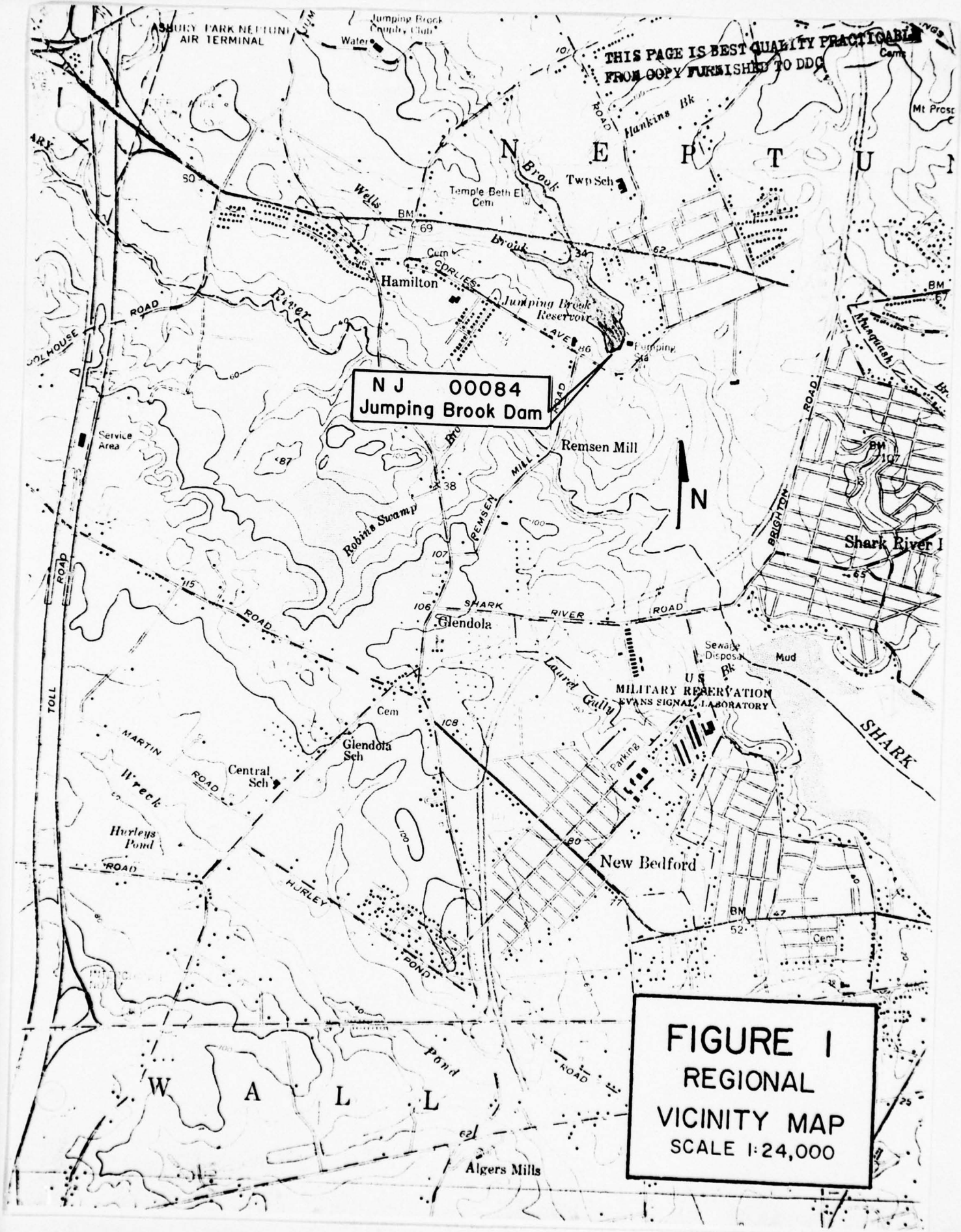


FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24,000

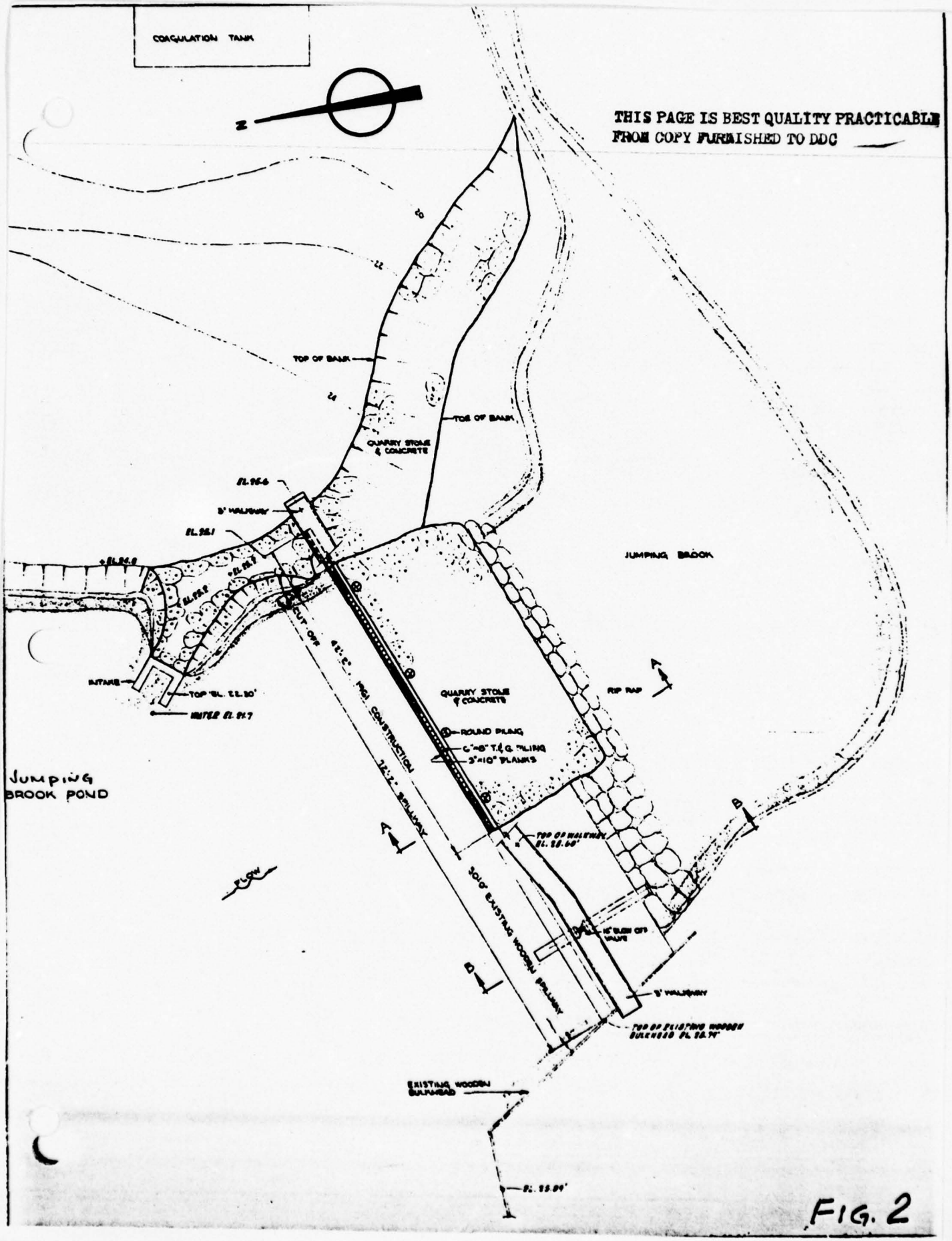
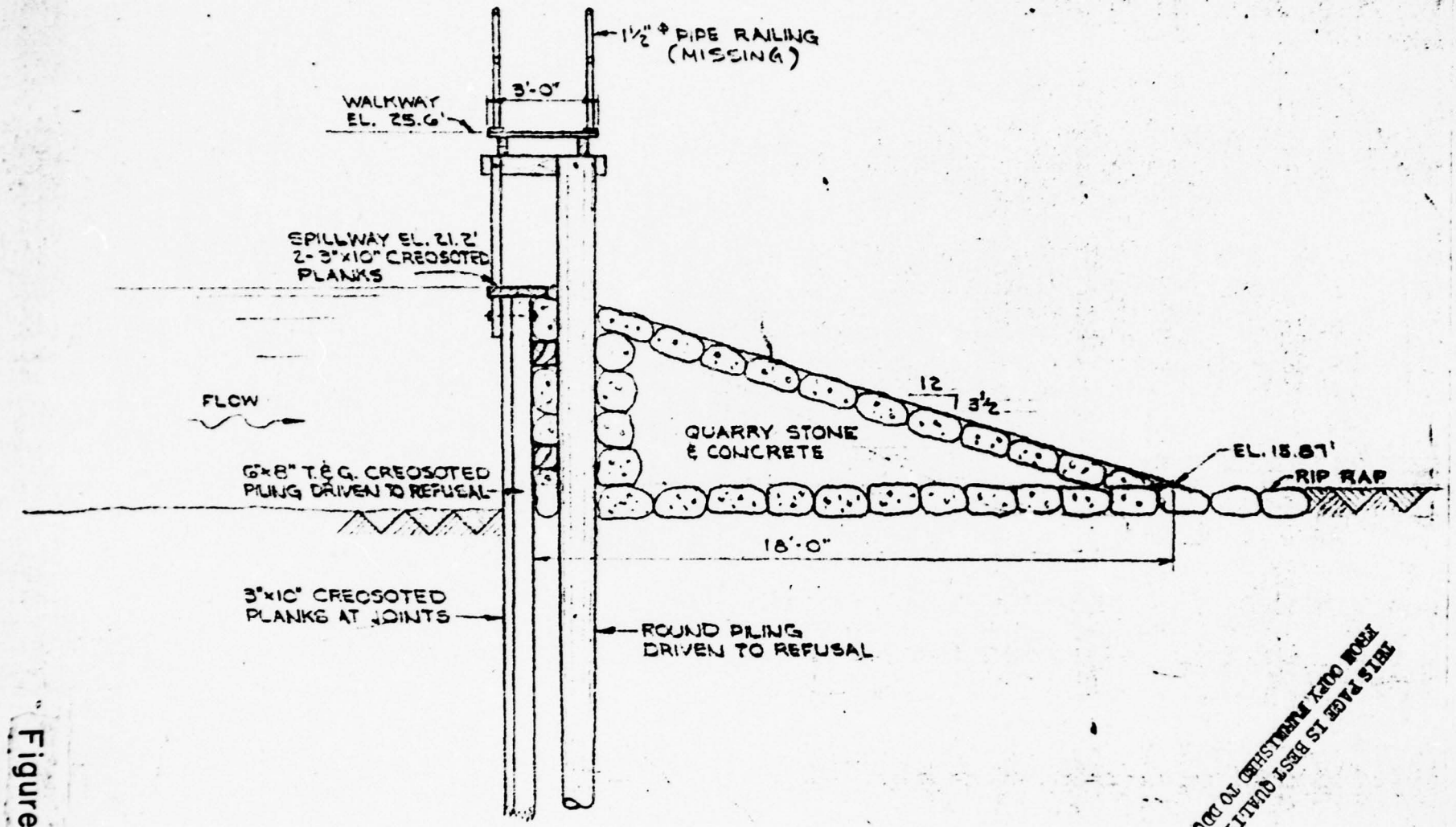
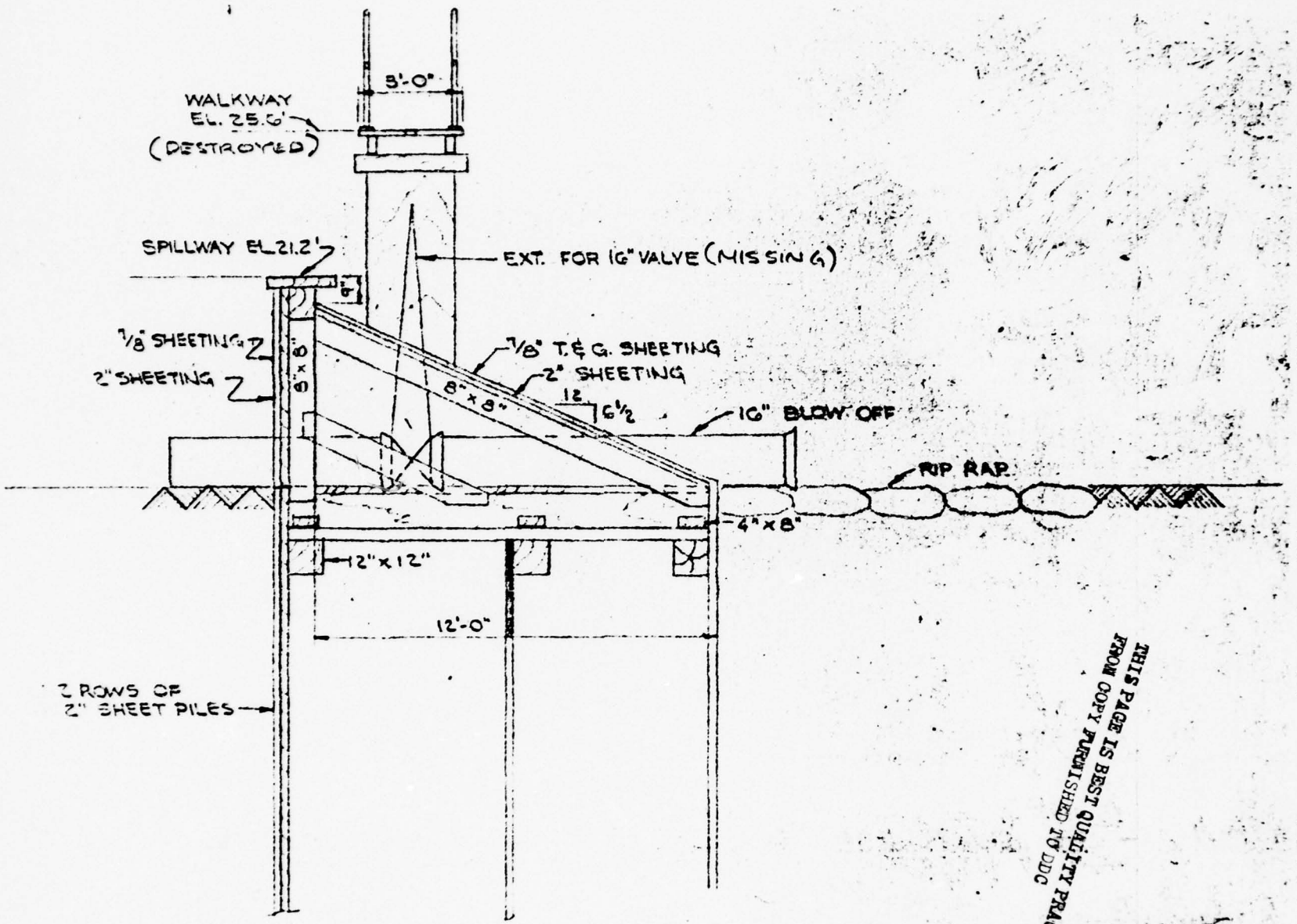


FIG. 2



SECTION A-A

Figure 3



SECTION B-B

Figure 4

Check List
Visual Inspection
Phase 1

Name Dam Jumping Brook Dam County Monmouth State New Jersey Coordinators NJDEP

Date(s) Inspection 12/15,29/78 Weather Clear Temperature 35°

Pool Elevation at Time of Inspection 21.5± M.S.L. Tailwater at Time of Inspection 15.5± M.S.L.

Inspection Personnel:

T. Chapter	A. Sherman	K. Jolls
L. Baines	D. Edwards	E. Simone
W. Pearce		

L. Baines Recorder

Dam No. 00084

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Satisfactory	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	Unknown	Spillway constructed on timber piling.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	All timber structure
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	Satisfactory	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	Right wingwall is a timber bulkhead with a return into the bank.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion at right abutment embankment and behind timber bulkhead wingwall.	This is probably caused by runoff from adjoining hills.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory	
RIPRAP FAILURES	None	Miscellaneous crushed rock downstream of right abutment.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Minor erosion and seepage at right abutment.	
ANY NOTICEABLE SEEPAGE	Seepage at right abutment.	
STAFF GAGE AND RECORDER	U.S.G.S. Gage Station Neptune City No. 4077.6	
DRAINS	No embankment drains. Drop inlet to plant (see page 6).	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A.	
INTAKE STRUCTURE	Drop inlet structure with 16" cast iron intakes extends through the east wall and carries water to the filter plant.	
OUTLET STRUCTURE	None	
OUTLET CHANNEL	Narrow incised stream bed (10'± wide).	Channel is blocked up on sides by secondary growth.
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None at spillway.	U.S.G.S. V-notched weir is located approximately 50' downstream.
APPROACH CHANNEL	Silted and overgrown.	
DISCHARGE CHANNEL	Narrow channel in wider steep sided valley. Heavy growth along entire channel.	
BRIDGE AND PIERS	Footbridge approximately 125' downstream.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	V-notched weir approximately 50' downstream.	
PIEZOMETERS	None	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Generally steep and wooded. Slopes rise 30' - 50' above reservoir elevation on right side. Left bank not as high.	
SEDIMENTATION	Heavy sedimentation. Reservoir is overgrown with swamp grass and seeds. Very small portion of reservoir channel is remaining.	See photos.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Some debris - very narrow (10' +) Cornelius Avenue bridge (160' steel trestle) about 40' higher than streambed.	No danger to bridge.
SLOPES	Near vertical slopes.	
APPROXIMATE NO. OF HOMES AND POPULATION	None	Township of Neptune's new wastewater treatment plant.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available
REGIONAL VICINITY MAP	Available
CONSTRUCTION HISTORY	Incomplete records available
TYPICAL SECTIONS OF DAM	Available
HYDROLOGIC/HYDRAULIC DATA	N/A
OUTLETS - PLAN	N/A
- DETAILS	
-CONSTRAINTS -DISCHARGE RATINGS	
RAINFALL/RESERVOIR RECORDS	Available

ITEM	REMARKS
DESIGN REPORTS	N/A
GEOLOGY REPORTS	N/A
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	N/A
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	No borings or subsurface records available.
POST-CONSTRUCTION SURVEYS OF DAM	N/A
BORROW SOURCES.	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	Available
MODIFICATIONS	Available
HIGH POOL RECORDS	N/A
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Available
MAINTENANCE OPERATION RECORDS	N/A

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	Available
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	N/A

Dam Overview

December, 1978

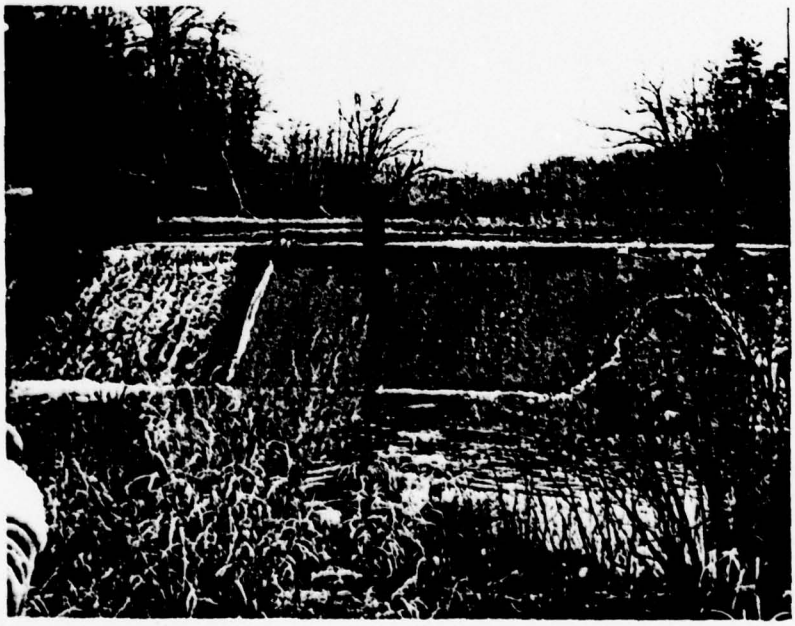
Upstream Reservoir

December, 1978

Spillway (Looking South)
December, 1978

Inspection Wall Supports
December, 1978

Downstream Channel
December, 1978



Right End of Spillway
December, 1978

Dam No. 00084

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 6.4 sq.miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): +21.2 M.S.L. (60 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): +25.8 M.S.L. (130 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 24.1 M.S.L. (Water Company records)

ELEVATION TOP DAM: +25.8

CREST:

a. Elevation +21.2
b. Type Broad crested weir
c. Width 1.5'
d. Length 72'
e. Location Spillover 70' from right abutment
f. Number and Type of Gates None

OUTLET WORKS: None except water supply intakes.

a. Type
b. Location
c. Entrance inverts
d. Exit inverts
e. Emergency draindown facilities

HYDROMETEOROLOGICAL GAGES: USGS Gage
a. Type Weir - vee notch
b. Location 50 ft. downstream
c. Records October 1966 - current

MAXIMUM NON-DAMAGING DISCHARGE: 1,700 ± cfs.

BY. D.J.M DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF.

CHKD. BY. DATE. SUBJECT Jumping Brook Dam Inspection PROJECT C227

Time of concentration

California Culverts method $L = 1.84$ miles; $H = 70'$

$$T_c = \left(\frac{11.9 \times 1.84^3}{70}\right)^{0.385}$$

$= 1.02$ hours

U.S. Navy & Texas Highway Department Method

Slope of watercourse $= \frac{70 \times 100}{9700} = 0.7\%$

Use $v \approx 2.0$ ft s^{-1}

$\therefore$ Time $\approx \frac{9700}{2 \times 3600} = 1.35$ hours

take value of 1.35 hours

BY D. J. M. DATE 1-7[illegible] **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A2

CHKD. BY ______ DATE ______ Jumping Brook Dam Inspection PROJECT C227

SUBJECT ______

$$T_p = \frac{0.25}{2} + 0.6 \times 1.35 = 0.94 \text{ hours}$$

$$Q_p = \frac{484 \times 6.4 \times 1}{0.94} = 3295$$

Time	T/T_p	Dimensionless ordinate (DO)	$Q_p \times$ DO = Q
0.25	0.27	0.134	442
0.50	0.53	0.450	1483
0.75	0.80	0.850	2801
1.00	1.06	0.960	3163
1.25	1.33	0.800	2636
1.50	1.60	0.56	1845
1.75	1.86	0.39	1285
2.00	2.13	0.25	824
2.25	2.39	0.18	593
2.50	2.66	0.12	395
2.75	2.93	0.083	273
3.00	3.19	0.06	195
3.25	3.46	0.039	129
3.50	3.72	0.025	82
3.75	3.99	0.018	59
4.00	4.26	0.013	43
4.25	4.52	0.008	26

BY D.J.M. DATE 1-79
CHKD. BY ____ DATE ____
SUBJECT ____

LOUIS BERGER & ASSOCIATES INC.

JUMPING BROOK DAM INSPECTION

SHEET NO. A3
PROJECT 4227

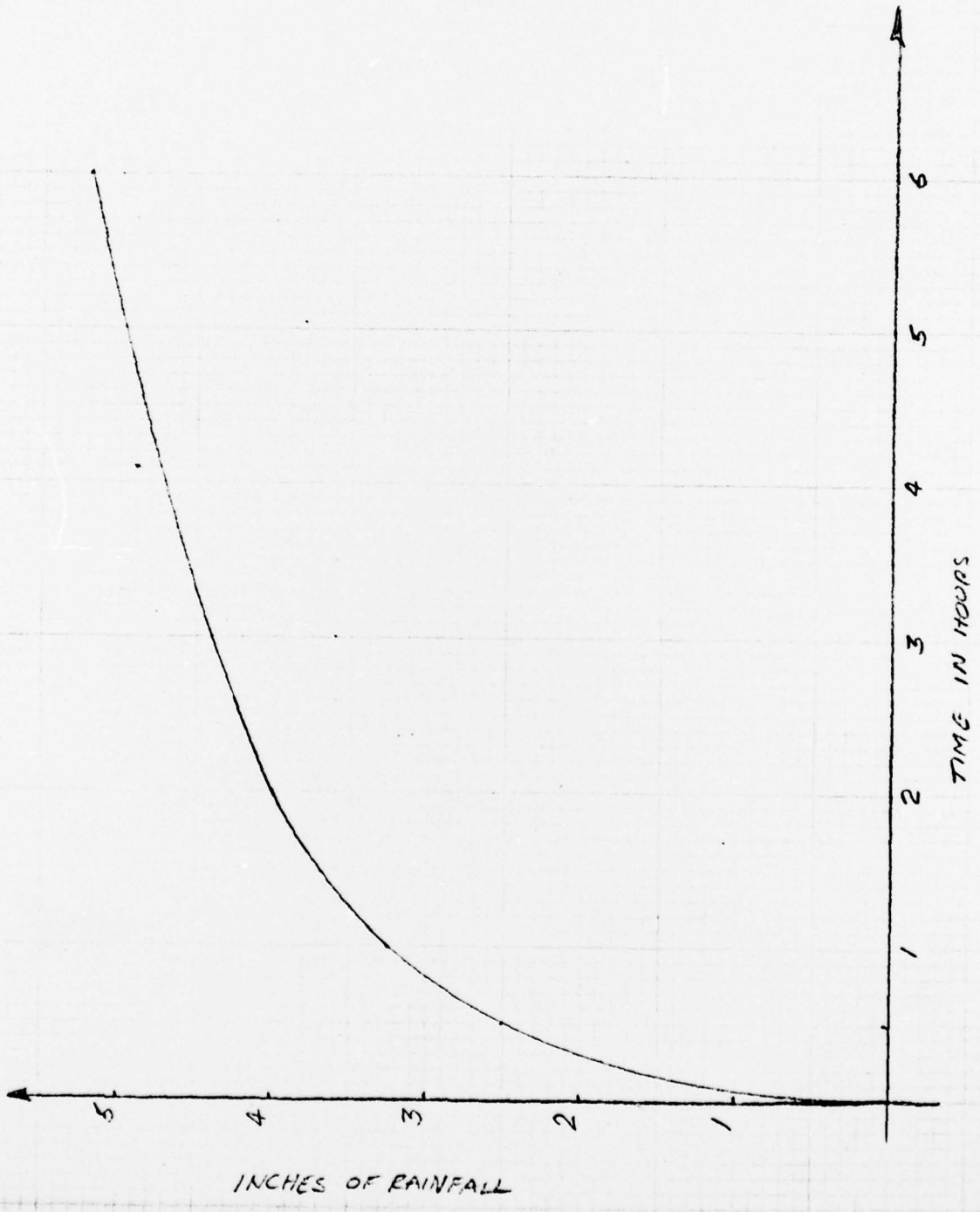
Precipitation Data from T.P. 40 (see depth/duration curve on page A2)

Time	Precipitation	Δ	Rearrange Δ
0.25	1.85	1.85	0.06
0.50	2.50	0.65	0.06
0.75	2.90	0.40	0.06
1.00	3.25	0.35	0.06
1.25	3.50	0.25	0.07
1.50	3.70	0.20	0.07
1.75	3.86	0.16	0.08
2.00	4.00	0.14	0.09
2.25	4.11	0.11	0.09
2.50	4.22	0.11	0.10
2.75	4.31	0.10	0.11
3.00	4.40	0.09	0.11
3.25	4.49	0.09	0.35
3.50	4.57	0.08	0.40
3.75	4.64	0.07	0.65
4.00	4.71	0.07	1.85
4.25	4.78	0.07	0.25
4.50	4.84	0.06	0.20
4.75	4.90	0.06	0.16
5.00	4.96	0.06	0.14
5.25	5.02	0.06	0.07
5.50	5.08	0.06	0.06
5.75	5.14	0.06	0.06
6.00	5.20	0.06	0.06

BY D.J.M DATE 1-79
CHKD. BY DATE

SUBJECT RAINFALL DEPTH DURATION CURVE - JUMPING BROOK DAM

SHEET NO. A4 OF
JOB NO. C227

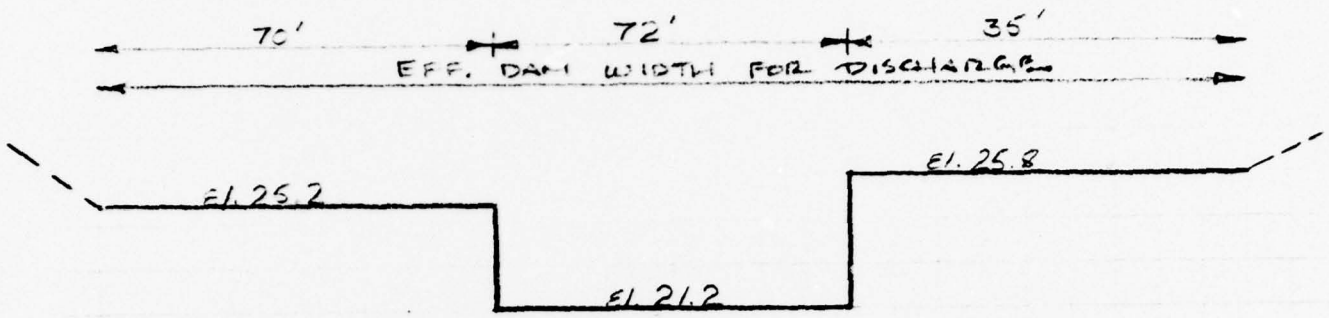


BY D.J.M DATE 1-79
CHKD. BY DATE
SUBJECT

LOUIS BERGER & ASSOCIATES INC.

JUMPING BROOK DAM INSPECTION

SHEET NO. A5 OF
PROJECT C227



DISCHARGE CAPACITY

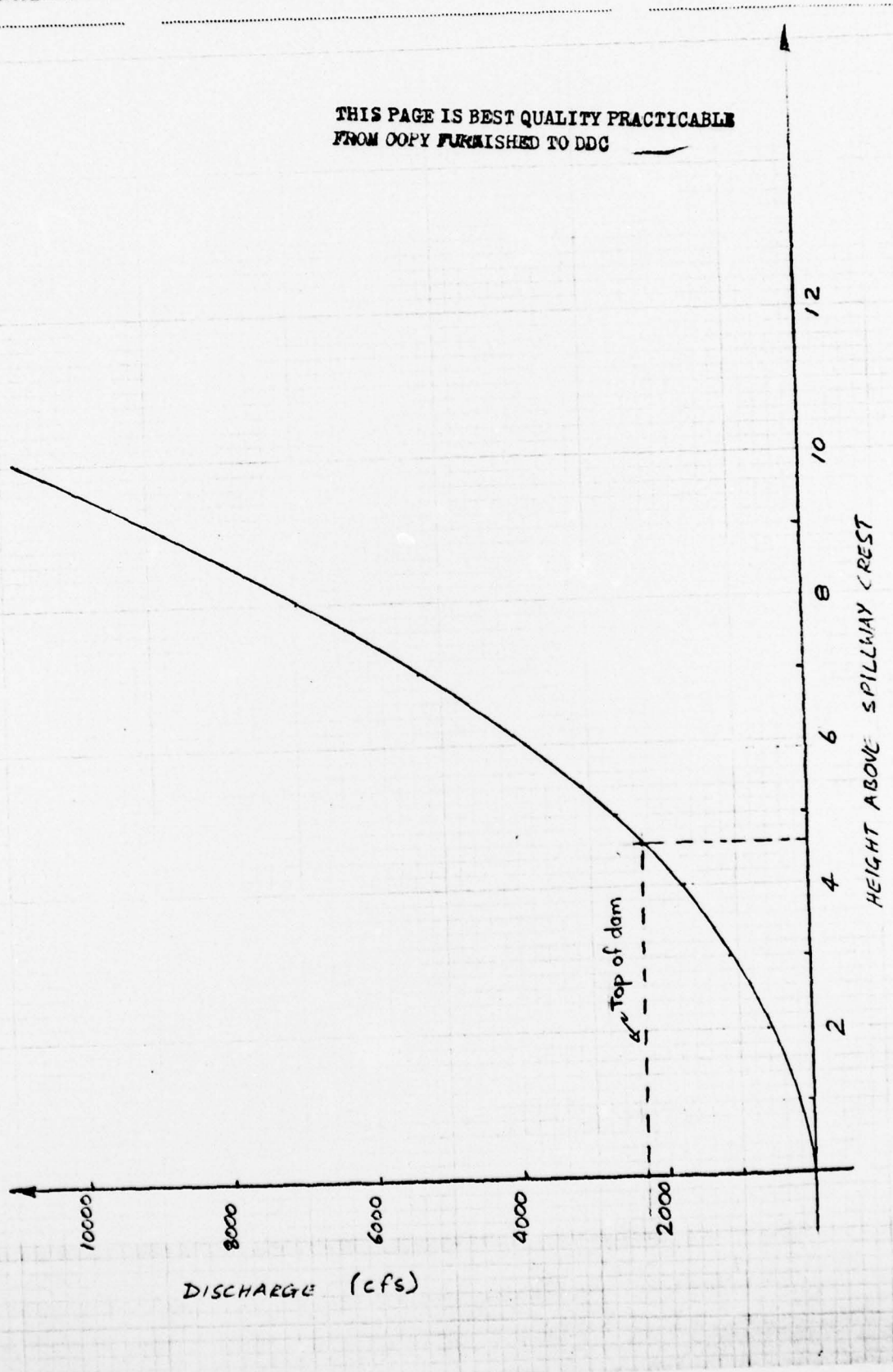
Overcrest L = 72'			Over Dam left L = 70'			Over Dam Right L = 35'			Σ Q
H	C	Q	H	C	Q	H	C	Q	
1	3.0	216							216
2	3.0	611							611
3	3.0	1122							1122
4	3.0	1728							1728
5	3.0	2415	1	2.7	189	0.4	2.6	23	2627
6	3.0	3175	2	2.7	535	1.4	2.6	151	3861
7	3.0	4000	3	2.7	982	2.4	2.6	338	5320
8	3.0	4888	4	2.7	1512	3.4	2.6	571	6971
9	3.0	5832	5	2.7	2113	4.4	2.6	840	8785
10	3.0	6831	6	2.7	2778	5.4	2.6	1142	10751

25.8
21.2

BY D.J.M DATE 1-79
CHKD. BY DATE

SUBJECT STAGE DISCHARGE CURVE
JUMPING BROOK DAM

SHEET NO. A6 OF
JOB NO. C227



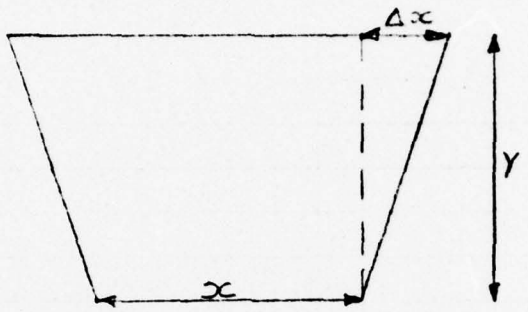
BY D.J.M DATE 1-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A7 OF

CHKD. BY DATE JUMPING BROOK DAM INSPECTION PROJECT C-227

SUBJECT SURCHARGE STORAGE

AREA OF LAKE @ EL. 21.2 = 13 acres

AREA OF CONTOUR @ EL. 40.0 = 30 acres



Increment in volume $\Delta V = (x + \Delta x) \times y$

HEIGHT ABOVE CREST (feet)	STORAGE (acre feet)
1	13
2	28
3	43
4	59
5	76
6	94
7	113
8	133
9	154
10	175

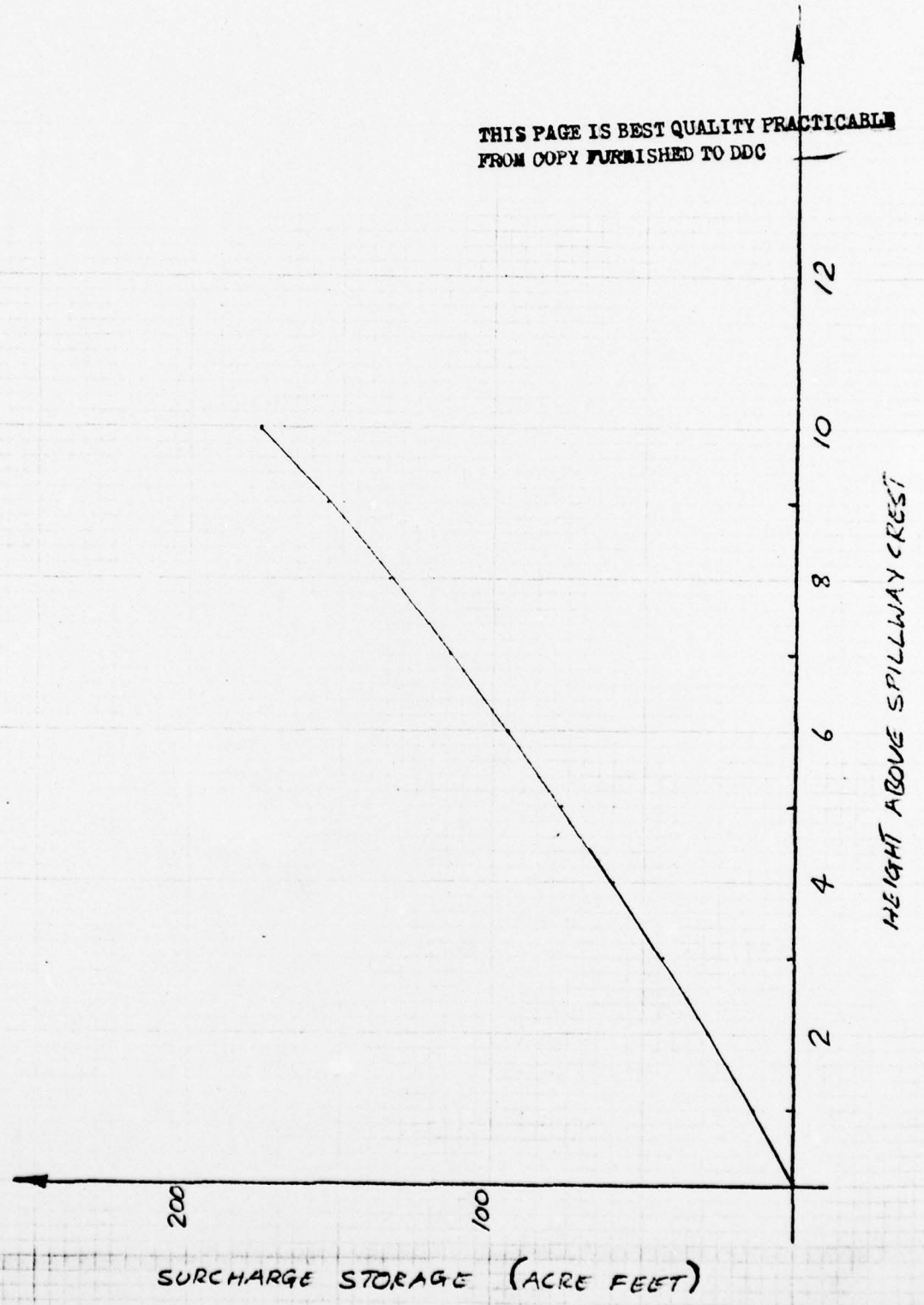
6,000,000 gals = 18.4 AF
7.5 × 43560 say 20 ?

13 × 4 − say 60 Conservation V = 60 AF
21 − 15.5 = 70
130 AF.

BY D J M DATE 1-79
CHKD. BY DATE

SUBJECT STAGE STORAGE CURVE
JUMPING BROOK DAM INSPECTION

SHEET NO. A 8 OF
JOB NO. C 227



BY. DJM DATE 1-72 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A9 OF.

CHKD. BY DATE JUMPING BROOK DAM INSPECTION PROJECT C227

SUBJECT APPROX MAX DRAWDOWN CALCULATIONS

Volume = 60 acre ft = 2613600 ft³

Drawdown lake under average head = 3.3'

Discharge for 16" pipe

≈ 12 cfs

$$\therefore \text{time} \approx \frac{2613600}{12 \times 3600} \approx 60 \text{ hours}$$

≈ 2 ½ days

∴ total drawdown time = 2.5 days

This calculation assumes outlet works are operable and that there is no inflow to the reservoir

JUMPING BROOK DAM INSPECTION NORTH GROUP C227
BY D.J.MULLIGAN
JANUARY 1979

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150.	0	15	0	0	0	0	0	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
6	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	6.40	0.0	6.40	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
24	0.0	0.0	0.0

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.14	0.16
0.20	0.30	0.40	0.40	0.70	1.70	0.11	0.11	0.09	0.09
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, NUHGQ= 17

442.	1483.	2801.	3167.	2636.	1845.	1285.	824.	593.	395.
273.	198.	129.	82.	59.	43.	26.			

UNIT GRAPH TOTALS 16277. CFS OR 0.99 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.00	0.
8	0.09	0.04	16.
9	0.14	0.11	104.

BY DJM DATE
CHKD. BY DATE
SUBJECT JUMPING BROOK DAM

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A-12 OF
PROJECT C-227

BY. R.J.M. DATE.....

CHKD. BY.....DATE.....

SUBJECT.....

LOUIS BERGER & ASSOCIATES INC.

JUMPING BROOK DAM

SHEET NO. A-11 OF.

PROJECT C-227

10	0.16	0.13	331.
11	0.20	0.16	714.
12	0.30	0.27	1218.
13	0.40	0.37	1861.
14	0.40	0.37	2660.
15	0.70	0.67	3663.
16	1.70	1.67	5315.
17	0.11	0.08	7513.
18	0.11	0.08	9304.
19	0.09	0.06	9066.
20	0.09	0.06	7380.
21	0.07	0.05	5481.
22	0.06	0.04	4069.
23	0.06	0.04	2964.
24	0.06	0.04	2278.
25	0.0	0.0	1713.
26	0.0	0.0	1302.
27	0.0	0.0	962.
28	0.0	0.0	660.
29	0.0	0.0	439.
30	0.0	0.0	298.
31	0.0	0.0	199.
32	0.0	0.0	119.
33	0.0	0.0	51.
34	0.0	0.0	34.
35	0.0	0.0	21.
36	0.0	0.0	13.
37	0.0	0.0	8.
38	0.0	0.0	4.
39	0.0	0.0	2.
40	0.0	0.0	1.
41	0.0	0.0	0.
42	0.0	0.0	0.
43	0.0	0.0	0.
44	0.0	0.0	0.
45	0.0	0.0	0.
46	0.0	0.0	0.
47	0.0	0.0	0.
48	0.0	0.0	0.
49	0.0	0.0	0.
50	0.0	0.0	0.
51	0.0	0.0	0.
52	0.0	0.0	0.
53	0.0	0.0	0.
54	0.0	0.0	0.
55	0.0	0.0	0.
56	0.0	0.0	0.
57	0.0	0.0	0.
58	0.0	0.0	0.
59	0.0	0.0	0.
60	0.0	0.0	0.
61	0.0	0.0	0.
62	0.0	0.0	0.
63	0.0	0.0	0.
64	0.0	0.0	0.
65	0.0	0.0	0.
66	0.0	0.0	0.
67	0.0	0.0	0.
68	0.0	0.0	0.
69	0.0	0.0	0.
70	0.0	0.0	0.

71	0.0	0.0	0.
72	0.0	0.0	0.
73	0.0	0.0	0.
74	0.0	0.0	0.
75	0.0	0.0	0.
76	0.0	0.0	0.
77	0.0	0.0	0.
78	0.0	0.0	0.
79	0.0	0.0	0.
80	0.0	0.0	0.
81	0.0	0.0	0.
82	0.0	0.0	0.
83	0.0	0.0	0.
84	0.0	0.0	0.
85	0.0	0.0	0.
86	0.0	0.0	0.
87	0.0	0.0	0.
88	0.0	0.0	0.
89	0.0	0.0	0.
90	0.0	0.0	0.
91	0.0	0.0	0.
92	0.0	0.0	0.
93	0.0	0.0	0.
94	0.0	0.0	0.
95	0.0	0.0	0.
96	0.0	0.0	0.
97	0.0	0.0	0.
98	0.0	0.0	0.
99	0.0	0.0	0.
100	0.0	0.0	0.
101	0.0	0.0	0.
102	0.0	0.0	0.
103	0.0	0.0	0.
104	0.0	0.0	0.
105	0.0	0.0	0.
106	0.0	0.0	0.
107	0.0	0.0	0.
108	0.0	0.0	0.
109	0.0	0.0	0.
110	0.0	0.0	0.
111	0.0	0.0	0.
112	0.0	0.0	0.
113	0.0	0.0	0.
114	0.0	0.0	0.
115	0.0	0.0	0.
116	0.0	0.0	0.
117	0.0	0.0	0.
118	0.0	0.0	0.
119	0.0	0.0	0.
120	0.0	0.0	0.
121	0.0	0.0	0.
122	0.0	0.0	0.
123	0.0	0.0	0.
124	0.0	0.0	0.
125	0.0	0.0	0.
126	0.0	0.0	0.
127	0.0	0.0	0.
128	0.0	0.0	0.
129	0.0	0.0	0.
130	0.0	0.0	0.
131	0.0	0.0	0.

132	0.0	0.0	0.	
133	0.0	0.0	0.	
134	0.0	0.0	0.	
135	0.0	0.0	0.	
136	0.0	0.0	0.	
137	0.0	0.0	0.	
138	0.0	0.0	0.	
139	0.0	0.0	0.	
140	0.0	0.0	0.	
141	0.0	0.0	0.	
142	0.0	0.0	0.	
143	0.0	0.0	0.	
144	0.0	0.0	0.	
145	0.0	0.0	0.	
146	0.0	0.0	0.	
147	0.0	0.0	0.	
148	0.0	0.0	0.	
149	0.0	0.0	0.	
150	0.0	0.0	0.	
SUM	5.20	4.26	69763.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9304.	2901.	727.	465.	69764.
INCHES		4.22	4.23	4.23	4.23
AC-FT		1439.	1442.	1442.	1442.

HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
66	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STORAGE=	0.	28.	43.	59.	76.	94.	113.	133.	154.	175.
OUTFLOW=	0.	611.	1122.	1728.	2627.	3841.	5320.	6971.	8785.	10751.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	0.	0.
5	0.	0.	0.
6	0.	0.	0.
7	0.	0.	0.
8	0.	8.	3.
9	1.	60.	24.
10	4.	214.	95.
11	12.	525.	253.
12	24.	966.	515.
13	40.	1539.	1008.
14	58.	2260.	1703.

BY DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

JUMPING BROOK DAM

SHEET NO. A-14 OF

PROJECT C-227

15	78.	3161.	2745.
16	99.	4489.	4213.
17	124.	6414.	6194.
18	148.	8408.	8263.
19	158.	9185.	9147.
20	148.	8223.	8261.
21	128.	6431.	6545.
22	108.	4775.	4931.
23	92.	3516.	3691.
24	79.	2621.	2804.
25	68.	1996.	2207.
26	59.	1508.	1716.
27	50.	1132.	1388.
28	41.	811.	1068.
29	33.	550.	798.
30	27.	369.	585.
31	21.	249.	461.
32	16.	159.	350.
33	12.	85.	253.
34	8.	42.	175.
35	6.	27.	121.
36	4.	17.	83.
37	3.	10.	56.
38	2.	6.	38.
39	1.	3.	25.
40	1.	2.	16.
41	0.	0.	11.
42	0.	0.	7.
43	0.	0.	4.
44	0.	0.	3.
45	0.	0.	2.
46	0.	0.	1.
47	0.	0.	1.
48	0.	0.	0.
49	0.	0.	0.
50	0.	0.	0.
51	0.	0.	0.
52	0.	0.	0.
53	0.	0.	0.
54	0.	0.	0.
55	0.	0.	0.
56	0.	0.	0.
57	0.	0.	0.
58	0.	0.	0.
59	0.	0.	0.
60	0.	0.	0.
61	0.	0.	0.
62	0.	0.	0.
63	0.	0.	0.
64	0.	0.	0.
65	0.	0.	0.
66	0.	0.	0.
67	0.	0.	0.
68	0.	0.	0.
69	0.	0.	0.
70	0.	0.	0.
71	0.	0.	0.
72	0.	0.	0.
73	0.	0.	0.
74	0.	0.	0.
75	0.	0.	0.

LOUIS BERGER & ASSOCIATES INC.

JUMPING BROOK DAM

76	0.	0.	0.
77	0.	0.	0.
78	0.	0.	0.
79	0.	0.	0.
80	0.	0.	0.
81	0.	0.	0.
82	0.	0.	0.
83	0.	0.	0.
84	0.	0.	0.
85	0.	0.	0.
86	0.	0.	0.
87	0.	0.	0.
88	0.	0.	0.
89	0.	0.	0.
90	0.	0.	0.
91	0.	0.	0.
92	0.	0.	0.
93	0.	0.	0.
94	0.	0.	0.
95	0.	0.	0.
96	0.	0.	0.
97	0.	0.	0.
98	0.	0.	0.
99	0.	0.	0.
100	0.	0.	0.
101	0.	0.	0.
102	0.	0.	0.
103	0.	0.	0.
104	0.	0.	0.
105	0.	0.	0.
106	0.	0.	0.
107	0.	0.	0.
108	0.	0.	0.
109	0.	0.	0.
110	0.	0.	0.
111	0.	0.	0.
112	0.	0.	0.
113	0.	0.	0.
114	0.	0.	0.
115	0.	0.	0.
116	0.	0.	0.
117	0.	0.	0.
118	0.	0.	0.
119	0.	0.	0.
120	0.	0.	0.
121	0.	0.	0.
122	0.	0.	0.
123	0.	0.	0.
124	0.	0.	0.
125	0.	0.	0.
126	0.	0.	0.
127	0.	0.	0.
128	0.	0.	0.
129	0.	0.	0.
130	0.	0.	0.
131	0.	0.	0.
132	0.	0.	0.
133	0.	0.	0.
134	0.	0.	0.
135	0.	0.	0.
136	0.	0.	0.

137	0.	0.	0.	
138	0.	0.	0.	
139	0.	0.	0.	
140	0.	0.	0.	
141	0.	0.	0.	
142	0.	0.	0.	
143	0.	0.	0.	
144	0.	0.	0.	
145	0.	0.	0.	
146	0.	0.	0.	
147	0.	0.	0.	
148	0.	0.	0.	
149	0.	0.	0.	
150	0.	0.	0.	
SUM			69764.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9147.	2886.	727.	465.	69764.
INCHES		4.20	4.23	4.23	4.23
AC-FT		1432.	1442.	1442.	1442.

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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	6	9304.	2901.	727.	465.	6.40
ROUTED TO	66	9147.	2886.	727.	465.	6.40